National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 3148a

Spectrometric Standard Solution

Scandium

Batch Code 390204

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3148a is a single element solution prepared gravimetrically to contain 10.00 mg/mL of scandium with a nitric acid concentration (V/V) of ten percent. The certified value is based on a gravimetric procedure, i.e., weight per volume composition of the high-purity oxide dissolved in NIST high-purity reagents.

Metal	Concentration (mg/mL)	Source Purity, %	Acid Conc. (V/V) Approximate
Sc	9.99 ± 0.02	Sc_2O_3 (99.99)[a]	HNO_3, 10%

[a]This high-purity material was analyzed by inductively coupled plasma mass spectrometry and found to contain less than 100 μg/g total impurities.

The certified value (V) is based on replicate titrations against a reference solution of Sc metal of known purity. The value has been adjusted upward by 0.1% relative, based on estimated transpiration losses of solvent through the container walls of 0.2% relative per year after the bottle is removed from the plastic sleeve.

The uncertainty in the certified value is calculated as:

$$U = (2u_c + 0.001V) \text{ mg/mL}$$

where U_c is the "combined uncertainty" calculated according to the CIPM approach. [1] The value of U_c is intended to represent, at the level of one standard deviation, the combined effect of uncertainty components associated with volumetric, gravimetric, and titrimetric factors, as well as the purity of the Sc metal. The additional quantity, 0.001V, is an allowance for transpiration of the solution through the container walls, which is estimated to be ± 0.1% of the certified value during the one-year period of validity of the certification.

SRM 3148a was prepared by T.A. Butler of the NIST Inorganic Analytical Research Division. Inductively coupled plasma mass spectrometric and titrimetric analyses were made by G.C. Turk and C.A. Beck II.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899
May 24, 1993

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

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Procedures for Use

Stability: This certificate is valid for one year from the shipping date provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of representative solutions from the SRM lot and if any changes occur that invalidate this certification, NIST will notify purchasers.

Preparation of Working Standard Solutions: All solutions should be brought to 22 ± 1 °C before use and all glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by serial dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from 100 μg/mL dilutions of the original SRM solution.

NOTICE TO USERS: The same acid mixture as listed on this SRM certificate should be used in making appropriate dilutions and working standards. For some instrumental techniques, small differences in acid type and concentration of the standard and sample may lead to erroneous results.

REFERENCE

[1] Barry N. Taylor and Chris E. Kuyatt, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results" NIST Technical Note 1297, National Institute of Standards and Technology, Technology Administration, U.S. Department of Commerce, 1993.